

VASCULAR PLANTS OF EASTERN IMPERIAL COUNTY, CALIFORNIA

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ABSTRACT

An annotated catalogue of the vascular flora was compiled from field collections and herbarium records from the eastern third of Imperial Co., California, including wetland habitats along the lower Colorado River. The study area is located in the Lower Colorado Valley subdivision of the Sonoran Desert, an arid area with little elevational relief. The flora is correspondingly depauperate, with only 278 native species recorded from 2050 km², including 56 species found only in wetland habitats along the lower Colorado River. Ecological and floristic factors that contribute to the low diversity include a relative lack of habitat differentiation among desert species and the lack of a well developed herbaceous perennial flora.

The Lower Colorado Valley subdivision of the Sonoran Desert (Shreve 1951) in eastern Imperial Co., California, is one of the driest parts of the desert region of the southwestern United States and northwestern Mexico. It is perhaps also the most poorly known area botanically in California. The objective of this study was to catalogue the flora of this area, emphasizing the desert habitats and the wetland habitats along the lower Colorado River. This area was selected for study because it is centered within a section of the Sonoran Desert for which no other local floras have been compiled; the data were used in a broader study of the floristics of the southwestern U.S. (McLaughlin 1986).

STUDY AREA

The study area includes most of Imperial Co. east of 115°W longitude (Fig. 1). The Riverside Co. line and the International Boundary form the northern and southern boundaries, respectively; the eastern boundary is the Colorado River. Wetland habitats along both river banks are included in the study area. The western boundary excludes the Algodones Dune field, which has its own distinctive

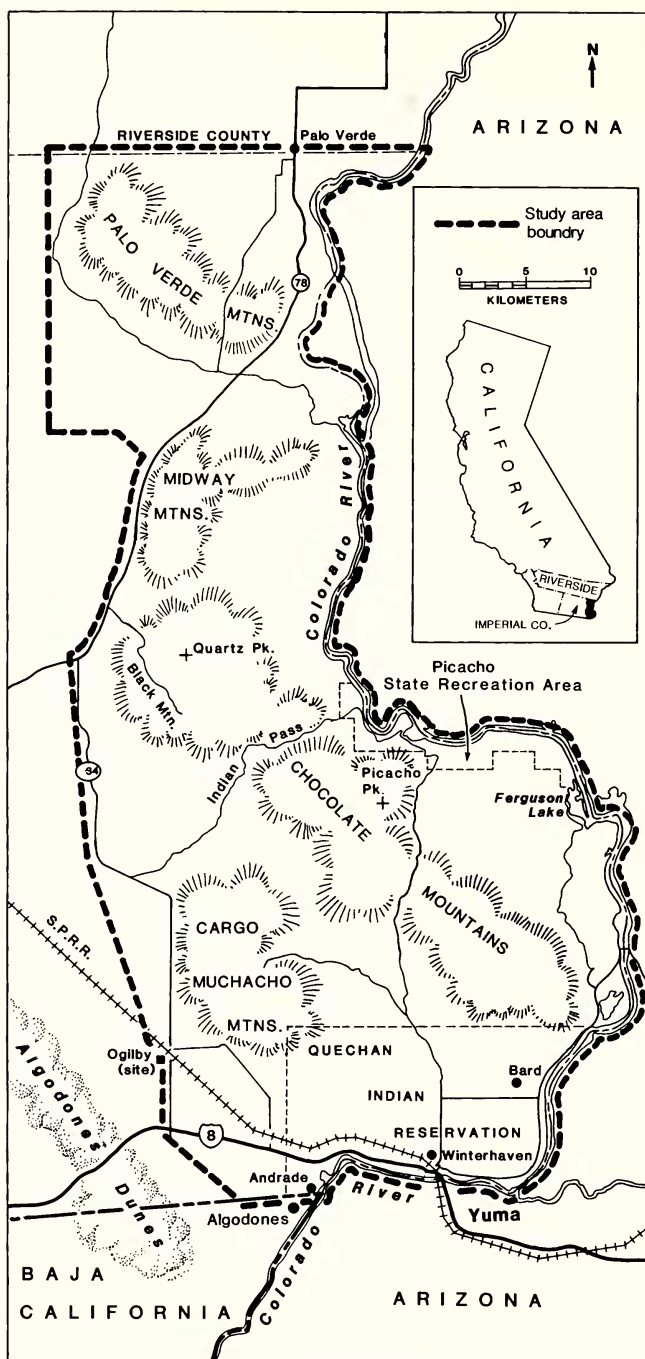


FIG. 1. Map of study area in eastern Imperial Co., extreme southeastern corner of California.

TABLE 1. CLIMATIC DATA FOR STATIONS ADJACENT TO STUDY AREA (WILLMOTT ET AL. 1981).

Station	Lat.	Long.	Elev. (m)	Mean monthly temperature (°C)		Precipitation (mm)	
				Jan	Jul	Winter Oct– Mar	Sum- mer Apr– Sep
Amos, CA	33°6'	115°13'	78	12.4	35.2	40	21
Blythe, CA	33°36'	114°36'	82	10.2	32.6	63	37
Brawley, CA	32°59'	115°32'	–36	11.4	32.3	47	15
Mexicali, B.C.	32°39'	115°39'	4	11.8	33.0	48	23
Quartzsite, AZ	33°40'	114°15'	147	10.1	34.0	77	70
Yuma, AZ	32°44'	114°37'	42	12.4	32.8	53	31

flora (Bowers 1984), and the Chocolate Mountains Naval Gunnery Range, to which access is restricted.

The study area is approximately 2050 km². Elevations range from near sea level to 664 m at Quartz Peak in the Chocolate Mountains. The major mountain ranges in the area include the Palo Verde Mountains in the north, the Cargo Muchacho Mountains in the southwest, and the Chocolate Mountains that form an irregular mass trending northwest to southeast across the center of the area. Picacho Peak, a distinctive landmark 29 km north of Yuma, lies in the Chocolate Mountains.

The climate of the study area is extremely arid (Table 1). Annual rainfall varies from about 60 mm in the southwest corner to about 100 mm in the higher elevations. Most of the rain occurs in the winter; late summer storms in September account for most of the rain that falls from April through October. Mean daily maximum summer temperatures are 38–41°C; winter temperatures seldom drop below freezing.

VEGETATION AND HABITATS

Deserts

The vegetation of the Lower Colorado Valley subdivision of the Sonoran Desert has been described by Shreve (1925, 1951) and Turner and Brown (1982). Because of the extreme aridity of the area, the vegetation is remarkably monotonous. Undisturbed sections of the desert on mountain slopes, bajadas, and sandy flats are all dominated by *Larrea tridentata*–*Ambrosia dumosa* microphyllous desert (Shreve 1951). The low-lying, fine-textured soils of the Colorado River floodplains that are currently under cultivation—the eastern

half of the Quechan (formerly Ft. Yuma) Indian Reservation and the Palo Verde Valley—were probably once extensive *Atriplex* flats (Turner and Brown 1982).

Mountains, slopes, and flats. A group of about a dozen woody and succulent species are dominant on mountain tops, steep, rocky slopes (Fig. 2), gentle slopes (Fig. 3), and sandy and gravelly flats (Fig. 4). These species are: *Larrea tridentata*, *Ambrosia dumosa*, *Encelia farinosa*, *Hilaria rigida*, *Opuntia acanthocarpa*, *O. basilaris*, *O. bigelovii*, *Cercidium floridum*, *Fouquieria splendens*, *Krameria grayi*, *Lycium andersonii*, and *Fagonia laevis*. A few species are confined mostly to broad, sandy washes (Fig. 5): *Justicia californica*, *Bebbia juncea*, *Chilopsis linearis*, *Acacia greggii*, *Olneya tesota*, *Psoralea spinosa*, *Lycium fremontii*, and *L. torreyi*. Fewer species are confined to the relatively mesic, steep, north-facing slopes within the study area: *Pleurocoronis pluriseta*, *Salazaria mexicana*, and *Galium stellatum*. Several are found only in broad, sandy washes and north-facing slopes, suggesting that the two habitats are similar in their moisture availability. Included in this last group are *Ambrosia ilicifolia*, *Trixis californica*, *Hyptis emoryi*, *Condalia globosa*, and *Zizyphus obtusifolia*.

The common annuals also display a low degree of habitat differentiation. Many species occur in washes, on sandy and gravelly flats, on rocky slopes of all aspects, and on mountain tops. Common species include *Oligomeris linifolia*, *Lupinus arizonicus*, *Camissonia brevipes*, *C. refracta*, *Chaenactis carphoclinia*, *Phacelia crenulata*, *Mentzelia involucrata*, *Mohavea confertiflora*, *Cryptantha angustifolia*, *Plantago fastigiata*, and *Eriogonum thomasi*.

Desert pavement and riverine dunes. Two habitats of special interest are desert pavement and riverine dunes. Desert pavement refers to unusually barren flats covered by a closely-packed layer of pebbles, which usually have a well-developed coating of desert varnish (Musick 1975). Pavement soils are typically saline and sodic and have very low infiltration rates. They are consequently the driest habitats in the desert. Shrubs, mostly *Larrea* and *Ambrosia dumosa* in the study area, occur only along narrow channels or runnels. Annuals most commonly found on the pavement are *Phacelia neglecta*, *Chorizanthe rigida*, *Oligomeris linifolia*, and *Plantago fastigiata*.

Riverine dunes are low dunefields that occur infrequently on the floodplain adjacent to the Colorado River. Dunes have high rates of infiltration and consequently are relatively mesic habitats (Bowers 1982). Riverine dunes in the study area are dominated by *Atriplex canescens* subsp. *linearis* and *Tessaria sericea*. Some annuals that are common on dunes elsewhere in the Sonoran Desert region are found only on riverine dunes in the study area. These include *Dicoria*



FIGS. 2-5. Desert habitats of eastern Imperial Co., California. 2. North-facing slope in Cargo Muchacho Mountains, with sparse cover of *Encelia farinosa* and *Ambrosia dumosa*. 3. Gentle slopes (bajadas) south of Picacho Peak. The sparse cover in the foreground is mostly *Larrea tridentata*; *Cercidium floridum* and *Olneya tesota* line the wash in the midground. 4. Sandy flat south of Cargo Muchacho Mountains with *Encelia farinosa*, *Larrea tridentata*, and *Ambrosia dumosa*. 5. Ferguson Wash at southeast end of Chocolate Mountains; Ferguson Lake, Colorado River, and Martinez Lake in the background. Dense vegetation along wash includes *Cercidium floridum*, *Olneya tesota*, and *Condalia globosa*.

canescens, *Loeseliastrum schottii*, *Cryptantha costata*, *C. micrantha*, and *Phacelia pediculoides*.

Phytogeography. The study area is of interest to historical phytogeography because it is one of the few areas within the Southwest that remained a desert throughout the Wisconsin glaciation (Cole 1986). During the last ice age the vegetation and flora more closely resembled that occurring today in the Mohave Desert to the north. Species recorded from packrat middens found near Picacho Peak and dated to 13,000 yr B.P. include *Coleogyne ramosissima*, *Chrysothamnus teretifolius*, *Salvia mohavensis*, *Eriogonum fasciculatum*, *Brickellia atractyloides*, *Yucca brevifolia*, and *Yucca whipplei*, none of which occur in the modern flora. Species in the modern flora that were present in the oldest middens include *Larrea tridentata*, *Opuntia acanthocarpa*, *O. basilaris*, and *Ferocactus acanthodes*. Many of the modern dominants of the area, including *Ambrosia dumosa*, *Olneya tesota*, *Fouquieria splendens*, *Bebbia juncea*, *Ambrosia ili-*

cifolia, *Petalonyx linearis*, and *Fagonia laevis* do not appear in the fossil record until the last few thousand years.

Wetlands

The vegetation along the Colorado River has changed considerably during historical times. Doubtless there also have been undocumented changes in the flora. Extensive gallery forests of *Populus fremontii* and *Salix gooddingii* once lined both banks of the river (Grinnell 1914, Minckley and Rinne 1985). These gallery forests have been replaced by thickets of *Tamarix chinensis*, *Tessaria sericea*, *Salix exigua*, *Prosopis pubescens*, *Baccharis emoryi*, and *B. glutinosa* in the study area (Fig. 6). These thickets have been called "Sonoran riparian scrublands" by Minckley and Brown (1982).

Other important wetland habitats occurring along the river include sandbars, marshes, and alkaline depressions. Sandbars are inundated by the spring floods and exposed when water levels recede in the summer and fall. Older sandbars are dominated by *Salix exigua*, *Typha domingensis*, *Tamarix chinensis*, and other perennials; younger sandbars (Fig. 7) provide habitats for several annual and perennial species of *Cyperus*, *Eleocharis*, *Juncus*, and various Asteraceae. The marshes (Fig. 8) were described by Minckley and Brown (1982) and are dominated by several species of emergent perennials, including *Scirpus californicus*, *Typha domingensis*, and *Phragmites australis*, usually in dense, monospecific stands (Fig. 9).

The alkaline depressions form in fine-textured soils at the upper limit of spring floods (Grinnell 1914); dominant species include *Distichlis spicata*, *Suaeda moquinii*, and *Eustoma exaltatum*. Grinnell (1914) included *Allenrolfea occidentalis* as a dominant of such sites, but we have yet to encounter this widespread plant in the study area.

FLORA

The known vascular plant flora of the study area includes only 322 species (Table 2). Of these, 44 are introduced species, 12 are "native weeds" found mostly on disturbed sites (e.g., *Trianthema portulacastrum*, *Amaranthus palmeri*, *Conyza canadensis*, *Monolepis nuttalliana*, *Helianthus annuus*), and 56 species are found only in wetland habitats along the Colorado River. The flora of the undisturbed desert areas includes only 210 species. The low rainfall and moderate topographic relief within the study area probably account for the rather depauperate flora. Because of the extreme aridity, plant species do not "partition" the topographic gradient into several distinct habitats. Flats, washes, slopes, and mountain tops are uniformly unfavorable for much of the growing season for most of the



FIGS. 6-9. Wetland habitats of eastern Imperial Co., California. 6. Gallery forest remnant in Imperial National Wildlife Refuge. Trees are *Populus fremontii* and *Salix gooddingii*; dense thicket below trees along Colorado River includes *Phragmites australis*, *Tessaria sericea*, and *Tamarix chinensis*. 7. Recently formed sandbar in Colorado River, densely colonized by *Typha domingensis*. 8. Marsh at Picacho State Recreation Area with *Typha domingensis*. 9. Marsh with dense stand of *Scirpus californicus*.

flora. In other words, extreme aridity reduces habitat diversity, with a concomitant reduction in species diversity.

There are 15 genera within the study area with four or more species. *Camissonia* (7 spp.), *Cryptantha* (7 spp.), *Opuntia* (6 spp.), *Phacelia* (6 spp.), *Atriplex* (5 spp.), *Mentzelia* (5 spp.), *Astragalus* (4 spp.), and *Eriogonum* (4 spp.) are widespread and common throughout the Intermountain Southwest. *Chamaesyce* (5 spp.), *Lycium* (4 spp.), and *Aristida* (4 spp.) are well developed in the southern desert biogeographic provinces and *Scirpus* (5 spp.), *Cyperus* (4 spp.), *Eleocharis* (4 spp.), and *Juncus* (4 spp.) are widespread in warm temperate wetlands.

A tabulation of the flora by life-forms shows a high percentage of annuals and shrubs in the study area (Table 3). The absolute number of species of annuals and shrubs is probably no greater than would be expected on the basis of the size and elevational range of the study area (Bowers and McLaughlin 1982). This flora differs from more mesophytic southwestern floras in its low number of herbaceous perennials; annuals and shrubs are only *relatively* more abun-

TABLE 2. SUMMARY OF THE VASCULAR PLANT TAXA FOUND IN EASTERN IMPERIAL CO., CALIFORNIA, INCLUDING THE TEN LARGEST FAMILIES (LISTED IN DECREASING NUMBER, BY SPECIES).

Group	No. of families	No. of genera	No. of species	No. of non-natives
Vascular cryptogams	1	1	1	0
Gymnosperms	1	1	3	0
Dicotyledons	49	167	256	27
Monocotyledons	11	38	62	17
Total all groups	62	207	322	44
Asteraceae		41	48	2
Poaceae		25	32	14
Fabaceae		14	22	2
Boraginaceae		6	17	0
Cyperaceae		4	14	1
Chenopodiaceae		7	12	5
Polygonaceae		4	12	4
Solanaceae		6	12	2
Cactaceae		6	11	0
Euphorbiaceae		5	11	0

dant here due to the poor development of an herbaceous perennial flora. Only 50 species of perennial herbs occur in the undisturbed desert habitats, accounting for only 24% of the desert flora. In the more mesic wetlands of the Colorado River Valley, 35 herbaceous perennial species account for 63% of the species found only in wetland habitats on the study site. In the desert areas perennial herbs often are restricted to the relatively mesic microsites, i.e., steeper north-facing slopes and shaded banks of washes in deep sand.

ANNOTATED CATALOGUE

Botanical nomenclature follows Munz (1974), except where noted. Each species is annotated with notes on distribution and frequency. Frequency classes are: rare—known from only one or two localities or collections; infrequent—known from several localities, but found in only one or two habitats; occasional—often encountered, but found mostly in particular habitats; common—often encountered, occurring in several different habitats; and widespread—usually found in several different habitats. Collection numbers, except where noted, are for our collections deposited at ARIZ.

The catalogue is based primarily on our collections and field notes from 1983–1986. In addition, a list of species that are likely to occur in the study area was drawn up and the herbarium records at ARIZ, ASU, RSA, and SD were examined for collections of these species.

TABLE 3. GROWTH FORMS OF SPECIES FOUND IN EASTERN IMPERIAL CO. STUDY SITE AND THROUGHOUT THE SOUTHWESTERN UNITED STATES. ¹ Source: McLaughlin (1986).

Growth form	Percent of native species in:		
	Eastern Imperial Co.		Southwestern United States ¹
	Deserts	Wetlands	
Trees	2.4	7.1	4.3
Shrubs	21.9	5.4	14.8
Herbaceous perennials	23.8	62.5	53.0
Annuals	46.7	25.0	24.6
Succulents	5.2	0.0	3.3

Our emphasis was on the native, terrestrial species; aquatic and wetland habitats along the Colorado River were collected from several localities accessible by land and were more extensively examined by boat during the fall of 1986. Agricultural areas and other disturbed habitats were less intensively collected. Introduced species are preceded by an asterisk (*).

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PTEROPHYTA

Pteridaceae

Notholaena parryi D. C. Eaton. Rare; n.-facing slopes, northwest end of Palo Verde Mtns.; 2897.

CONIFEROPHYTA

Ephedraceae

Ephedra aspera Engelm. Widespread; slopes and washes; 2762, 2893.

Ephedra fasciculata A. Nels. var. *clokeyi* (Cutler) Clokey. Occasional; slopes, Cargo Muchacho Mtns.; 2959.

Ephedra trifurca Torr. Rare; Larrea flats east of Midway Well; Wiggins 8552 (ARIZ).

ANTHOPHYTA—DICOTYLEDONEAE

Acanthaceae

Justicia californica (Benth.) D. Gibson [*Beloperone c.* Benth.]. Common; washes; 2802.

Aizoaceae

**Mesembryanthemum nodiflorum* L. [*Gasoul n.* (L.) Rotm.]. Occasional; alkaline depressions; 2632, 3242.

Trianthema portulacastrum L. Infrequent; fields and roadsides; 4138.

Amaranthaceae

Amaranthus palmeri S. Wats. Infrequent; fields and roadsides; 3054.

Tidestromia oblongifolia (S. Wats.) Standl. Common; flats and slopes; 2618, 2718.

Apiaceae

- Daucus pusillus* Michx. Rare; washes, west of Palo Verde Mtns.; 2880.
Hydrocotyle verticillata Thunb. Occasional; sandbars, banks of irrigation ditches; 3243, 3491.

Asclepiadaceae

- Asclepias albicans* S. Wats. Occasional; rocky slopes; 2934.
Asclepias erosa Torr. Rare; sandy wash near Midway Well; 3477.
Asclepias subulata Decne. Occasional; sandy flats; 3008.
Sarcostemma cynanchoides Decne. subsp. *hartwegii* (Vail) R. Holm. Occasional; washes, climbing in perennials; 2650.
Sarcostemma hirtellum (Gray) R. Holm. Occasional; washes; 2891, 2925.

Asteraceae

- Ambrosia dumosa* (Gray) Payne. Widespread; flats and all slopes; 3479.
Ambrosia ilicifolia (Gray) Payne. Occasional; washes and on n.-facing slopes about Picacho Peak; 2803.
Aster exilis Ell. Infrequent; sandbars; 3050.
Aster spinosus Benth. Infrequent; irrigation ditches and field borders; 3485.
Atrichoseris platyphylla Gray. Common; washes and gravelly slopes; 2647, 2811.
Baccharis emoryi Gray. Infrequent; sandbars, thickets, and marshes; 3055.
Baccharis glutinosa Pers. Common; sandbars and thickets; 3024, 3052.
Baileya pauciradiata Harv. & Gray. Infrequent; riverine dunes; 3224.
Baileya pleniradiata Harv. & Gray. Common; sandy flats and riverine dunes; 3026, 3134.
Bebbia juncea (Benth.) Greene. Common; washes; 3469.
Calycoseris wrightii Gray. Rare; rocky slopes and flats, Palo Verde Mtns.; 2902, 2926.
Chaenactis carphoclinia Gray. Common; slopes and washes; 2659, 2805.
Chaenactis stevioides Hook. & Arn. Common; slopes, washes, and riverine dunes; 2862, 2890, 3226.
Conyza canadensis (L.) Cronq. Infrequent; sandbars and disturbed sites; 3051.
Dicoria canescens Torr. & Gray. Rare; riverine dunes; Thornber, 22 Sep 1912 (ARIZ).
Dyssodia porophylloides Gray. Infrequent; slopes and canyons, Palo Verde Mtns.; 2914.
Eclipta alba (L.) Hassk. Rare; Colorado River, open water; Thornber 24 Sep 1912 (ARIZ), Pinkava et al. 10,358 (ASU).
Encelia farinosa Gray. Widespread; flats and mostly s.-facing slopes; 2759.
Encelia frutescens (Gray) Gray. Occasional; washes and on sandy flats near Ogilby Hills; 2904.
Geraea canescens Torr. & Gray. Widespread; flats, slopes, and desert pavement; 3473.
Gnaphalium purpureum L. Infrequent; sandbars and thickets; 3230.
Helianthus annuus L. subsp. *lenticularis* (Dougl.) Ckll. Infrequent; fields and roadsides; 2855, 3492.
Heterotheca sp. Occasional; sandbars; 3023, 4154, 4163, 4168.
Heterotheca subaxillaris (Lam.) Britt. & Rusby. Rare; sandbars north of Yuma; 3044.
Hymenoclea salsola Torr. & Gray. Common; washes; 2745.
Hymenoxys odorata DC. Infrequent; sandbars; Thornber 22 Sep 1912 (ARIZ), Ferris 22 Apr 1928 (RSA).
 **Lactuca serriola* L. Infrequent; disturbed ground; 3483.
Machaeranthera tephrodes (Gray) Greene. Infrequent; disturbed areas, roadsides; 3465.
Malacothrix glabrata Gray. Rare; rocky slopes, Palo Verde Mtns.; 2903.
Monoptilon belliioides (Gray) Hall. Widespread; washes, slopes, and flats; 2763, 2770.

- Palafoxia arida* B. L. Turner & M. I. Morris [*P. linearis* (Cav.) Lag.]. Common; sandy flats and riverine dunes; 2641, 2921, 3225.
- Pectis papposa* Harv. & Gray. Infrequent; sandy flats near Ogilby; 3060.
- Perityle emoryi* Torr. Widespread; washes, flats, and rocky slopes; 3470.
- Peucephyllum schottii* Gray. Common; mostly n.-facing, rocky slopes; 3487.
- Pleurocoronis pluriseta* (Gray) King & H. E. Robins. Common; n.-facing slopes; 2736.
- Pluchea odorata* (L.) Cass. [*P. purpurascens* (Sw.) DC.]. Common; sandbars and marshes; 2724, 3025.
- Porophyllum gracile* Benth. Occasional; slopes and flats; 2717, 2932.
- Prenanthes exigua* (Gray) Rydb. [*Stephanomeria e.* Nutt.]. Rare; rocky slopes, Palo Verde Mtns.; 2892.
- Psathyrotes ramosissima* (Torr.) Gray. Occasional; flats and slopes; 2636.
- Rafinesquia neomexicana* Gray. Common; washes and flats; rare on riverine dunes; 2863, 3223.
- Senecio mohavensis* Gray. Infrequent; washes and n.-facing slopes; 2773, 2904.
- **Sonchus oleraceus* L. Occasional; roadsides, fields, wasteground; 2730, 3229.
- Stephanomeria pauciflora* (Torr.) Nutt. Occasional; washes; 2642.
- Stylocline micropoides* Gray. Infrequent; gravelly flats; 2887, 2974.
- Tessaria sericea* (Nutt.) Shinners [*Pluchea s.* (Nutt.) Cov.]. Widespread; marshes, thickets, sandbars, and riverine dunes; 3011, 3498.
- Trichoptilium incisum* (Gray) Gray. Occasional; gravelly slopes and flats; 2630, 2912.
- Trixis californica* Kell. Common; n.-facing slopes; 3478.
- Xanthium strumarium* L. var. *canadense* (Mill.) Torr. & Gray. Rare; sandy banks; 4168B.

Bignoniaceae

- Chilopsis linearis* (Cav.) Sweet var. *arcuata* Fosb. Infrequent; washes; 2804.

Boraginaceae

- Amsinckia intermedia* Fisch. & Mey. Infrequent; washes, Palo Verde Mtns.; 2873.
- Amsinckia tessellata* Gray. Rare; n.-facing slope, Picacho Peak; 2798.
- Cryptantha angustifolia* (Torr.) Greene. Widespread; slopes, flats, washes, and riverine dunes; 2616, 2740, 2781.
- Cryptantha barbiger* (Gray) Greene. Occasional; sandy flats and washes; 2741, 2752, 2937.
- Cryptantha costata* Brandegees. Infrequent; riverine dunes; 3220.
- Cryptantha holoptera* (Gray) Macbr. Occasional; n.-facing slopes; 2734, 2737, 2789, 2799.
- Cryptantha maritima* (Greene) Greene. Common; sandy washes; 2631, 2739.
- Cryptantha micrantha* (Torr.) Johnst. Infrequent; riverine dunes; 3140.
- Cryptantha pterocarya* (Torr.) Greene. Infrequent; n.-facing slopes; 2788, 2962.
- Heliotropium curassavicum* L. var. *oculatum* (Heller) Jtn. Infrequent; alkaline depressions; 2818, 2972.
- Pectocarya heterocarpa* (Johnst.) Johnst. Common; washes, flats, and slopes; 2776.
- Pectocarya platycarpa* (Munz & Johnst.) Munz & Johnst. Common; rocky flats, washes; 2866.
- Pectocarya recurvata* Johnst. Rare; slopes; 2928.
- Plagiobothrys jonesii* Gray. Infrequent; sandy washes; 2782.
- Tiquilia canescens* (DC.) A. Richards. [*Coldenia c.* DC.]. Infrequent; volcanic slopes; 2760.
- Tiquilia palmeri* (Gray) A. Richards. [*Coldenia p.* Gray]. Occasional; sandy flats; 2640, 2711.
- Tiquilia plicata* (Torr.) A. Richards. [*Coldenia p.* (Torr.) Cov.]. Occasional; riverine dunes and other sandy soils; 2850.

Brassicaceae

- **Brassica tournefortii* Gouan. Common; sandy flats and washes, roadsides; 2742.
Caulanthus lasiophyllus (Hook. & Arn.) Payson [*Thelypodium l.* (Hook. & Arn.) Greene]. Widespread; flats and washes; 2778.
Descurainia pinnata (Walt.) Britt. subsp. *glabra* (Woot. & Standl) Detl. Rare; wash near Mitchell's Camp; 2923.
Dithyrea californica Harv. Common; sandy flats and riverine dunes; 2919, 3141.
Draba cuneifolia Nutt. var. *integrifolia* S. Wats. Infrequent; washes and n.-facing slopes, Palo Verde Mtns.; 2870.
Lepidium lasiocarpum Nutt. Common; washes; 2779, 2883, 3135.
Lesquerella palmeri S. Wats. Rare; 27 mi n. of Ogilby; Alexander and Kellogg 1924 (RSA).
 **Sisymbrium irio* L. Widespread; washes and disturbed areas; 2884.

Cactaceae

- Cereus giganteus* Engelm. [*Carnegiea g.* (Engelm.) Britt. & Rose]. Rare; several individuals vicinity of Senator Wash camp area, one plant near Ferguson Lake. Grinnell (1914) noted 75 plants on the California side of the Colorado River; there are many fewer today.
Coryphantha vivipara (Nutt.) Britt. & Rose var. *alversonii* (Coulter) L. Benson. Rare; mapped in study area by Benson (1982).
Echinocactus polycephalus Engelm. & Bigel. Occasional; rocky slopes, Chocolate Mtns.
Ferocactus acanthodes (Lem.) Britt. & Rose. Occasional; rocky slopes.
Mammillaria tetrancistra Engelm. Widespread; rocky slopes.
Opuntia acanthocarpa Engelm. & Bigel. var. *coloradensis* L. Benson. Occasional; gravelly flats and slopes near Colorado River.
Opuntia basilaris Engelm. & Bigel. Widespread; flats and slopes.
Opuntia bigelovii Engelm. Occasional; rocky slopes.
Opuntia echinocarpa Engelm. & Bigel. Common; slopes and flats, Palo Verde Mtns.
Opuntia ramosissima Engelm. Occasional; sandy and gravelly flats.
Opuntia wigginsii L. Benson. Infrequent; flats and slopes, Palo Verde Mtns.

Campanulaceae

- Nemacladus glanduliferus* Jepson. Common; washes and flats; 2775, 2813, 2910.
Nemacladus rubescens Greene var. *tenuis* McVaugh. Rare; 2 mi n. of Cargo Muchacho Mtns.; Munz and Hitchcock 12145 (RSA).

Caryophyllaceae

- Achryonichia cooperi* Torr. & Gray. Infrequent; sandy flats and washes; 2939, 3246.
 **Spergularia marina* (L.) Griseb. Infrequent; alkaline depressions; 2973, 3232.

Ceratophyllaceae

- Ceratophyllum demersum* L. Infrequent; Colorado River, open water; Riccio 10, Minckley and Dunfee YLD-32, YLD-54 (ASU).

Chenopodiaceae

- Atriplex canescens* (Pursh) Nutt. subsp. *linearis* (S. Wats.) Hall & Clem. Occasional; alkaline depressions and riverine dunes; 3027.
Atriplex elegans (Moq.) D. Dietr. subsp. *fasciculata* (S. Wats.) Hall & Clem. Occasional; desert pavement and roadsides; 2869, 3059.
Atriplex hymenelytra (Torr.) S. Wats. Occasional; rocky slopes, Chocolate Mtns.; 3481.
Atriplex lentiformis (Torr.) S. Wats. Common; alkaline depressions; 2777.

Atriplex polycarpa (Torr.) S. Wats. Common; washes; 2635B.

**Bassia hyssopifolia* (Pall.) Kuntze. Infrequent; roadsides, sandbars; 3094.

**Chenopodium album* L. Occasional; fields and roadsides; 3028.

**Chenopodium murale* L. Common; fields and roadsides; 2615, 2845.

**Kochia scoparia* (L.) Schrad. Occasional; fields and wasteground; 2949.

Monolepis nuttalliana (Schult.) Greene. Occasional; roadsides; 2954.

**Salsola australis* R. Br. [S. *iberica* Sennen & Pau]. Common; roadsides, wasteground, and riverine dunes; 3461.

Suaeda moquinii Greene [S. *torreyana* S. Wats. var. *ramosissima* (Standl.) Munz]. Common; washes and alkaline depressions; 3480.

Convolvulaceae

Cressa truxillensis HBK. Infrequent; alkaline depressions; McMurray 1396 (ARIZ).

Cucurbitaceae

Brandegea bigelovii (S. Wats.) Cogn. Occasional; climbing in trees and shrubs, washes; 3476.

Cucurbita palmata S. Wats. Rare; near Bard; Thorner 22 Sep 1912 (ARIZ).

Euphorbiaceae

Argythamnia lanceolata (Benth.) Muell.-Arg. [*Ditaxis l.* (Benth.) Pax & K. Hoffm.]. Common; washes and rocky slopes; 2746, 2755, 2758.

Argythamnia neomexicana Muell.-Arg. [*Ditaxis n.* (Muell.-Arg.) Heller]. Occasional; rocky slopes; 2613, 2738, 3061.

Argythamnia serrata (Torr.) Muell.-Arg. [*Ditaxis s.* (Torr.) Heller]. Infrequent; sandy flats; Thorne et al. 50920 (RSA), Balls and Everett 22900 (RSA).

Chamaesyce albomarginata (Torr. & Gray) Small. [*Euphorbia a.* Torr. & Gray]. Rare; Colorado River Valley; Peirson 7200 (RSA).

Chamaesyce micromera (Boiss.) Woot. & Standl. [*Euphorbia m.* Boiss.]. Infrequent; sandy flats and washes; 2714, 3061.

Chamaesyce pediculifera (Engelm.) Rose & Standl. [*Euphorbia p.* Engelm.]. Occasional; rocky slopes, flats; 2915.

Chamaesyce polycarpa (Benth.) Millsp. var. *hirtella* (Boiss.) Millsp. [*Euphorbia p.* Benth. var. *h.* (Engelm.) Wheeler]. Widespread; washes and sandy and gravelly flats; 2614.

Chamaesyce setiloba (Engelm.) Millsp. [*Euphorbia s.* Engelm.]. Common; sandy washes and flats; 2719.

Croton californicus Muell.-Arg. var. *mohavensis* Ferg. Occasional; sandy flats; 2941.

Euphorbia eriantha Benth. Infrequent; washes; 2757, 2878.

Stillingia spinulosa Torr. Infrequent; sandy flats near Ogilby; Balls and Everett 22899 (RSA), Jones 8 May 1903 (RSA).

Fabaceae

Acacia greggii Gray. Common; washes; 2806.

Astragalus aridus Gray. Rare; found along the lower Colorado River Valley according to Barneby (1964).

Astragalus insularis Kell. var. *harwoodii* Munz & McBurney. Infrequent; sandy flats; 2942, 2946.

Astragalus lentiginosus Dougl. var. *borreganus* Jones. Rare; near Ogilby; Balls and Everett 22896 (RSA), Armstrong 1129 (SD).

Astragalus nuttallianus DC. var. *imperfectus* (Rydb.) Barneby. Rare; washes and sandy flats; 2886, 2943.

Caesalpinia virgata Fisher [*Hoffmannseggia microphylla* Torr.]. Infrequent; rocky slopes; 2909.

- Calliandra eriophylla* Benth. Occasional; washes and flats near Cargo Muchacho Mtns.; 2756, 2931.
- Cercidium floridum* Benth. Common; washes; 3468.
- Dalea mollis* Benth. Widespread; sandy and gravelly flats; 2715, 2776.
- Dalea mollissima* (Rydb.) Munz. Occasional; gravelly flats; 2733B, 2749.
- Lotus tomentellus* Greene. Occasional; washes and sandy flats; 2653, 2944, 3137.
- Lupinus arizonicus* (S. Wats.) S. Wats. Common; washes, flats, and slopes; 2645, 2814.
- Marina parryi* (Torr. & Gray) Barneby [*Dalea p.* Torr. & Gray]. Infrequent; washes and flats; 2898.
- **Melilotus albus* Desr. Infrequent; disturbed ground; 3460.
- **Melilotus indicus* (L.) All. Infrequent; roadsides, fields, irrigation ditches; 3247.
- Olneya tesota* Gray. Widespread; washes; 3472.
- Prosopis glandulosa* Torr. var. *torreyana* (L. Benson) M. C. Johnst. Occasional; broad washes; 3489.
- Prosopis pubescens* Benth. Infrequent; thickets along Colorado River; 2658.
- Psorothamnus emoryi* (Gray) Barneby [*Dalea e.* Gray]. Infrequent; sandy soils along Colorado River and Picacho Wash at All-American Canal; 2957, 3456. We have yet to find *Pilostyles thurberi* Gray on plants in our study area.
- Psorothamnus schottii* (Torr.) Barneby [*Dalea s.* Torr.]. Infrequent; washes; 2655.
- Psorothamnus spinosus* (Gray) Barneby [*Dalea s.* Gray]. Widespread; washes; 3474.
- Sesbania exaltata* (Raf.) Cory. Infrequent; sandbars, fields and irrigation ditches; 3047.

Fouquieriaceae

- Fouquieria splendens* Engelm. Widespread; desert pavement, flats, and rocky slopes.

Gentianaceae

- Eustoma exaltatum* (L.) Griseb. Infrequent; sandbars and alkaline depressions; 3016.

Geraniaceae

- **Erodium cicutarium* (L.) L'Her. Occasional; roadsides; 2917.
- Erodium texanum* Gray. Infrequent; gravelly flats and slopes; 2888.

Haloragaceae

- Myriophyllum exalbescens* Fern. Occasional; open water; 3042.

Hydrophyllaceae

- Eucrypta micrantha* (Torr.) Heller. Occasional; densely vegetated washes and n.-facing slopes; 2875, 2958.
- Nama demissum* Gray. Occasional; sandy washes; 2796.
- Nama hispidum* Gray var. *spatulatum* (Torr.) C. L. Hitchc. Occasional; sandy flats, washes; 2624, 2947.
- Phacelia ambigua* Jones var. *minutiflora* (Voss) Atwood [*P. minutiflora* J. Voss]. Common; washes, flats, and rocky slopes; 2810, 2872.
- Phacelia crenulata* Torr. Widespread; washes, flats, rocky slopes; 2651, 2868.
- Phacelia neglecta* Jones. Common; desert pavement, broad washes; 2795, 2868.
- Phacelia pachyphylla* Gray. Infrequent; slopes and washes; 2664, 3245.
- Phacelia pedicellata* Gray. Infrequent; rocky slopes; 2801.
- Phacelia pediculoides* (J. T. Howell) Constance. Rare; riverine dunes; 3138.

Krameriaceae

- Krameria grayi* Rose & Painter. Common; rocky slopes and flats; 2638.
Krameria parviflora Benth. var. *imparata* J. F. Macbr. Common; rocky slopes; Thorne et al. 50910 (RSA), Ferris 7172 (RSA).

Lamiaceae

- Hyptis emoryi* Torr. Common; broad washes and n.-facing slopes; 2743.
Salazaria mexicana Torr. Rare; n.-facing slopes, vicinity Picacho Peak; 2800, 2965.
Teucrium cubense L. Rare; Palo Verde Valley; J. and L. Roos 4201 (RSA), Jepson 5258 (RSA).

Loasaceae

- Mentzelia affinis* Greene. Rare; vicinity Cargo Muchacho Mtns.; Peirson 9791 (RSA), Munz and Hitchcock 12149 (RSA).
Mentzelia albicaulis (Hook.) Torr. & Gray. Infrequent; washes; 2874.
Mentzelia californica Thompson & Roberts. Rare; granitic flats east of Ogilby Hills; 2938.
Mentzelia involucrata S. Wats. Common; washes, flats, and rocky slopes; 2628.
Mentzelia longiloba J. Darl. Occasional; sandy flats, riverine dunes; 2955, 3136, 3227.
Petalonyx linearis Greene. Infrequent; rocky slopes; 2535, 2933.
Petalonyx thurberi Gray. Rare; 3 mi w. of Winterhaven; Raven 12909 (RSA), McMinn 1453 (RSA).

Lythraceae

- Ammania coccinea* Rottb. Rare; sandbars; Irwin 3 (ARIZ), Thornber 22 Sep 1912 (ARIZ).
Lythrum californicum Torr. & Gray. Infrequent; sandbars; 3019, 3045, 4165.

Malvaceae

- Eremalche rotundifolia* (Gray) Greene. Occasional; washes and gravelly flats; 2560, 2884.
Hibiscus denudatus Benth. Occasional; washes, flats, and slopes; 2716, 2754.
Horsfordia alata (S. Wats.) Gray. Rare; broad washes; 2750.
Horsfordia newberryi (S. Wats.) Gray. Rare; wash, Picacho State Rec. Area; 2732.
**Malva parviflora* L. Common; roadsides and fields.
Sida leprosa (Ort.) K. Schumm. var. *hederacea* K. Schumm. Infrequent; weed in cultivated areas; 4137.
Sphaeralcea ambigua Gray. Common; rocky slopes; 2720, 2960.
Sphaeralcea emoryi Torr. Occasional; sandy flats; 2968.

Martyniaceae

- Proboscidea althaeifolia* (Benth.) Decne. Rare; flats; Thorne et al. 50914 (RSA), Stark 1546 (RSA).

Nyctaginaceae

- Abronia villosa* S. Wats. Common; sandy flats, riverine dunes; 2945, 3142.
Allionia incarnata L. Common; rocky slopes; 3486.
Boerhaavia erecta L. var. *intermedia* (Jones) Kearney & Peebles. Infrequent; roadsides; 3058, 4144.
Boerhaavia triquetra S. Wats. Infrequent; washes and flats; 2734.

Boerhaavia wrightii Gray. Infrequent; washes, roadsides; 2725, 3056, 4143.
Mirabilis bigelovii Gray. Common; washes and n.-facing slopes; 2769, 2899.

Onagraceae

Camissonia arenaria (A. Nels.) Raven. Rare; rocky slopes; 2905.
Camissonia boothii (Dougl.) Raven subsp. *condensata* (Munz) Raven. Occasional; sandy flats; 2864, 2969.
Camissonia brevipes (Gray) Raven. Common; washes, flats; 2639, 2885, 2924.
Camissonia cardiophylla (Torr.) Raven. Common; rocky slopes, washes; 2619, 2787.
Camissonia chamaenerioides (Gray) Raven. Infrequent; washes and slopes; 2877, 2964.
Camissonia clavaeformis Torr. & Frem. subsp. *aurantiaca* (S. Wats.) Raven. Common; gravelly flats; 2876, 2889, 2970.
Camissonia refracta (S. Wats.) Raven. Common; washes and gravelly flats; 2646, 2816.
Oenothera deltoides Torr. & Frem. Infrequent; northeast side of Palo Verde Mtns.; Klein 144 (RSA).

Orobanchaceae

Orobanche cooperi (Gray) Heller. Infrequent; sandy and gravelly flats; Munz and Hitchcock 12152 (RSA), Balls and Everett 22927 (RSA).

Papaveraceae

Eschscholzia minutiflora S. Wats. Common; washes and flats; 2768.
Eschscholzia parishii Greene. Infrequent; flats n. of Cargo Muchacho Mtns.; 2927.

Pedaliaceae

**Sesamum indicum* L. Infrequent; cultivated in Colorado River Valley and occasionally found along roadsides; 4141.

Plantaginaceae

Plantago fastigiata Morris [*P. insularis* Eastw. var. *fastigiata* (Morris) Jeps.]. Widespread; slopes, flats, and washes; 2648.

Polemoniaceae

Gilia latifolia S. Wats. Infrequent; sandy washes; 2652.
Gilia stellata Heller. Widespread; washes, slopes, and flats; 2764, 2791, 2815, 2908.
Langloisia setosissima (Torr. & Gray) Greene. Occasional; washes, flats and slopes; 2649, 2817, 2911.
Linanthus jonesii (Gray) Greene. Occasional; washes and sandy flats; 2774, 2929.
Loeseliastrum schottii (Torr.) Timbrook [*Langloisia schottii* (Torr.) Greene]. Rare; riverine dunes; 2951, 3228.

Polygonaceae

Chorizanthe brevicornu Torr. Common; washes and flats; 2622, 2767.
Chorizanthe corrugata (Torr.) Torr. & Gray. Common; sandy and gravelly flats; 2629, 2871, 2936.
Chorizanthe rigida (Torr.) Torr. & Gray. Common; desert pavement, flats, and washes; 2623.
Eriogonum deflexum Torr. Common; washes and gravelly flats; 2621.
Eriogonum inflatum Torr. & Frem. Common; gravelly flats and slopes; 3467.
Eriogonum thomasi Torr. Widespread; washes, slopes, flats; 2625, 2657, 2857, 2867.

Eriogonum trichopes Torr. Infrequent; flats and gentle slopes; 2930.

**Polygonum argyrocoleon* Steud. Infrequent; alkaline depressions; 3234.

**Polygonum aviculare* L. Occasional; roadsides and wasteground; 2950.

Polygonum fusiforme Greene. Infrequent; marshes, canals, banks of Colorado River; 3236, 3248.

**Rumex conglomeratus* Murr. Infrequent; disturbed ground; 3493.

**Rumex persicarioides* L. Occasional; alkaline depressions and sandbars; 3015, 3235.

Portulacaceae

Calandrinia ambigua (S. Wats.) Howell. Infrequent; sandy flats; 2922.

Resedaceae

Oligomeris linifolia (Vahl) J. F. Macbr. Widespread; washes, desert pavement, sandy and gravelly slopes; 3463.

Rhamnaceae

Colubrina californica I. M. Johnst. Rare; Gavilan Wash e. of Indian Pass, Chocolate Mtns.; 2766.

Condalia globosa I. M. Johnst. var. *pubescens* I. M. Johnst. Common; broad washes and n.-facing slopes; 2858.

Zizyphus obtusifolia (Hook.) Gray [*Condaliopsis lycioides* (Gray) Suesseng var. *canescens* (Gray) Suesseng]. Occasional; n.-facing slopes; 3488.

Rubiaceae

Galium stellatum Kell. subsp. *eremicum* (Hilend & Howell) Ehrendf. Infrequent; n.-facing slopes, Palo Verde and Cargo Muchacho Mtns.; 2894, 2963.

Salicaceae

Populus fremontii S. Wats. Common; thickets and marshes; 3482.

Salix exigua Nutt. Occasional; sandbars; 3029, 3048.

Salix gooddingii Ball. Common; thickets and marshes; 2847.

Scrophulariaceae

**Bacopa monnieri* (L.) Wettst. Occasional; sandbars; 3239.

Mohavea confertiflora (Benth.) Heller. Common; washes, slopes, and flats; 2656, 2771.

Penstemon pseudospectabilis Jones. Infrequent; n.-facing slopes, Chocolate and Palo Verde Mtns.; 2784, 2913, 2969.

Simmondsiaceae

Simmondsia chinensis (Link) Schneider. Infrequent; sandy flats; 2748, 2901.

Solanaceae

Datura discolor Bernh. Occasional; washes; 2712.

Lycium andersonii Gray. Common; washes and n.-facing slopes; 2633, 2747, 2786, 2845.

Lycium fremontii Gray. Infrequent; washes; 2807.

Lycium parishii Gray. Infrequent; washes, Palo Verde Mtns.; 2879.

Lycium torreyi Gray. Infrequent; sandy flats and washes near Colorado River; 2643, 2952.

**Nicotiana glauca* Grah. Infrequent; along drainage ditches; 3496.

Nicotiana trigonophylla Dunal. Common; washes and n.-facing slopes; 2654.

Petunia parviflora Juss. Infrequent; sandbars; *Swingle* 260 (ARIZ), *Monson* 11 (ARIZ), *Parish* 8322 (RSA).

Physalis acutifolia (Miers) Sandwith. Infrequent; weed of agricultural areas; 4139.

Physalis angulata L. var. *lanceolata* (Nees) Waterfall. Infrequent; weed of agricultural areas; 4140.

Physalis crassifolia Benth. var. *versicolor* (Rydb.) Waterfall. Occasional; washes, flats, and slopes; 2728, 2751, 2753.

**Solanum elaeagnifolium* Cav. Infrequent; roadsides and fields; 3053.

Tamaricaceae

**Tamarix chinensis* Lour. Common; marshes and thickets; 2634, 3030.

**Tamarix ramosissima* Ledeb. Occasional; washes, ditches, and alkaline depressions; 2794.

Urticaceae

Parietaria floridana Nutt. Rare; rocky, n.-facing slopes, Picacho Peak and vicinity, Chocolate Mtns.; 2797, 2966.

Viscaceae

Phoradendron californicum Nutt. Common; in *Olneya*, *Prosopis*, and *Acacia*; 3475.

Zygophyllaceae

Fagonia laevis Standl. Common; mostly on rocky slopes; 2617.

Fagonia pachyacantha Rydb. Infrequent; slopes, Picacho State Rec. Area; 2627.

Larrea tridentata (DC.) Coville. Widespread; sandy and gravelly slopes, washes, and steep rocky slopes; 2744.

**Tribulus terrestris* L. Occasional; roadsides, disturbed areas; 3009.

ANTHOPHYTA—MONOCOTYLEDONEAE

Alismataceae

Echinodorus berteroi (Spreng.) Fassett. Rare; marshes; *Monson* 2 (ARIZ).

Araceae

**Pistia stratiotes* L. Rare; drainage canal, Ft. Yuma; *Peebles and Noble*, 28 Oct 1941 (ARIZ).

Cyperaceae

**Cyperus alternifolius* L. Infrequent; sandbars near Yuma; 3014.

Cyperus erythrorhizos Muhl. Occasional; sandbars; 3012, 3022.

Cyperus laevigatus L. Infrequent; sandbars; 3241.

Cyperus odoratus L. Common; sandbars and marshes; 2852, 4134.

Eleocharis coloradoensis (Britt.) Gilly. Infrequent; sandbars; 4150.

Eleocharis geniculata (L.) Roemer & Schultes. Common; sandbars, marshes and thickets; 2851, 2860, 3497.

Eleocharis macrostachya Britton in Small. Rare; sandbars; *Thornber* 24 Sep 1912 (ARIZ).

Eleocharis parishii Britt. Infrequent; sandbars; 4153.

Fimbristylis vahlII (Lam.) Link. Infrequent; sandbars; *Parish* 8375 (RSA), *Thornber* 25 Sep 1912 (ARIZ).

Scirpus acutus Muhl. Rare; marshes; *Striegler* 20 (ARIZ), *Behrends* 1 (ASU).

Scirpus americanus Pers. Occasional; sandbars and marshes; 3240, 3244.

Scirpus californicus (C. A. Mey.) Steud. Common; marshes; 2859, 3020.

Scirpus robustus Pursh. Infrequent; sandbars and marshes; *Goodding 43-1* (ARIZ), *McMurray 1397* (ARIZ).

Scirpus validus Vahl. Infrequent; marshes; *Booth A-112* (ARIZ), *McMurray 1365* (ARIZ).

Juncaceae

Juncus acutus L. var. *sphaerocarpus* Engelm. Infrequent; sandbars; 3045, 3237, 3490.

Juncus articulatus L. Rare; sandbars; 4161.

Juncus bufonius L. Rare; sandbars; *Peebles and Harrison 5062* (ARIZ), *Griner 10 Mar 1941* (ARIZ).

Juncus torreyi Cov. Occasional; sandbars; 3020, 4147.

Lemnaceae

Lemna gibba L. Rare; drainage ditches; 3233, 3501.

Liliaceae

Hesperocallis undulata Gray. Occasional; sandy and gravelly flats; 2920.

Najadaceae

Najas marina L. Infrequent; Colorado River backwaters; 4159.

Poaceae

Aristida adscensionis L. Widespread; slopes, flats, and washes; 2637.

Aristida californica Thurb. Infrequent; riverine dunes and sandy flats; 3462.

Aristida purpurea Nutt. Occasional; slopes; 2906.

Aristida wrightii Nash. Occasional; slopes; 2846, 2895.

**Avena fatua* L. Common; fields and roadsides; 2856.

Bouteloua aristidoides (HBK.) Griseb. Common; sandy flats and washes; 2721.

Bouteloua barbata Lag. Infrequent; sandy and gravelly flats; 2722.

**Bromus catharticus* Vahl [*B. willdenowii* Kunth]. Infrequent; roadsides and waste-ground; 3238.

**Cynodon dactylon* (L.) Pers. Common; fields and roadsides.

Diplachne uninervia (Presl) Parodi [*Leptochloa u.* (Presl) Hitchc. & Chase]. Occasional; alkaline depressions and sandbars; 2723, 3231.

Distichlis spicata (L.) Greene var. *stricta* (Torr.) Beetle. Infrequent; alkaline depressions; 2971.

**Echinochloa colonum* (L.) Link. Infrequent; sandbars near Yuma; 3017.

Eragrostis pectinacea (Michx.) Nees. Infrequent; alkaline depressions; 2854.

Eriochloa aristata Vasey. Rare; near Bard; *Reeder 29 Jun 1944* (ARIZ).

Erioneuron pulchellum (HBK.) Tateoko. Occasional; slopes and flats; 2865.

Heteropogon contortus (L.) Beauv. Rare; wash, w. side of Palo Verde Mtns.; *Fuller 19014* (RSA).

Hilaria rigida (Thurb.) Benth. Common; washes and n.-facing slopes; 2713.

**Hordeum glaucum* Steud. Occasional; roadsides; 2916.

**Hordeum vulgare* L. Occasional; roadsides, sandy flats; 2918.

**Leptochloa filiformis* (Lam.) Beauv. Infrequent; weed in agricultural areas; 4142.

Muhlenbergia microsperma (DC.) Kunth. Common; washes; 2731, 2882.

**Paspalum dilatatum* Poir. Rare; disturbed ground; 3503.

Paspalum distichum L. Rare; irrigation ditch; *Goodding and Reeder 8 Sep 1943* (ASU).

**Pennisetum setaceum* (Forsk.) Chiov. Rare; roadside near Laguna Dam; 2849.

**Phalaris minor* Retz. Occasional; fields and roadsides; 2948.

Phragmites australis (Cav.) Trin. Widespread; marshes and sandbars; 2953, 4158.

**Polypogon monspeliensis* (L.) Desf. Occasional; irrigation and drainage ditches; 2853, 3494.

- **Schismus barbatus* (L.) Thell. Common; flats and washes; 2761.
 **Sorghum bicolor* Moench. Infrequent; roadsides; *Barr* 66-39 (ARIZ).
 **Sorghum halepense* (L.) Pers. Infrequent; fields and wasteground; 4135.
Tridens muticus (Torr.) Nash. Rare; n.-facing slopes, Palo Verde Mtns.; 2896.
Vulpia octoflora Rydb. [*Festuca o.* Walt.]. Occasional; washes; 2784.

Potamogetonaceae

- **Potamogeton crispus* L. Common; shallow water in Colorado River; 4146.
Potamogeton foliosus Raf. Infrequent; Colorado River; 4160.
Potamogeton nodosus Poir. Rare; Colorado River; *Monson* 3 (ARIZ).
Potamogeton pectinatus L. Common; Colorado River; 3502, 4145.

Typhaceae

- Typha angustifolia* L. Infrequent; marshes; *Tuttle* 14 Sep 1959 (ARIZ).
Typha domingensis Pers. Common; marshes; 3459.

Zannichelliaceae

- Zannichellia palustris* L. Occasional; drainage ditches and sandbars; 3500, 4148.

LITERATURE CITED

- BARNEBY, R. C. 1964. Atlas of North American *Astragalus*. Mem. New York Bot. Gard. 13:1-1188.
 BENSON, L. 1982. The cacti of the United States and Canada. Stanford Univ. Press, Stanford, CA.
 BOWERS, J. E. 1982. The plant ecology of inland dunes in western North America. J. Arid Environ. 5:199-220.
 ———. 1984. Plant geography of southwestern sand dunes. Desert Plants 6:31-42, 51-54.
 ——— and S. P. McLAUGHLIN. 1982. Plant species diversity in Arizona. Madroño 29:227-233.
 COLE, K. L. 1986. The lower Colorado River Valley: a Pleistocene desert. Quat. Res. 25:392-400.
 GRINNELL, J. 1914. An account of the mammals and birds of the lower Colorado Valley. Univ. Calif. Publ. Zool. 12(4):51-294.
 McLAUGHLIN, S. P. 1986. Floristic analysis of the southwestern United States. Great Basin Nat. 46:46-65.
 MINCKLEY, W. L. and D. E. BROWN. 1982. Wetlands. In D. E. Brown, ed., Biotic communities of the American Southwest—United States and Mexico. Desert Plants 4:223-287.
 ——— and J. N. RINNE. 1985. Large woody debris in hot-desert streams: an historical review. Desert Plants 7:142-153.
 MUNZ, P. A. 1974. A flora of southern California. Univ. California Press, Berkeley.
 MUSICK, M. B. 1975. Barrenness of desert pavement in Yuma County, Arizona. J. Ariz. Acad. Sci. 10:24-28.
 SHREVE, F. 1925. Ecological aspects of the deserts of California. Ecology 6:93-103.
 ———. 1951. Vegetation of the Sonoran Desert. Carnegie Inst. Wash. Pub. 591, Washington, DC.
 TURNER, R. M. and D. E. BROWN. 1982. Sonoran desertscrub. In D. E. Brown, ed., Biotic communities of the American Southwest—United States and Mexico. Desert Plants 4:181-221.
 WILLMOTT, C. J., J. R. MATHER, and C. M. ROWE. 1981. Average monthly and annual surface air temperature and precipitation data for the world. Part 2. The Western Hemisphere. C. W. Thornthwaite Assoc. Publ. Climat. 34(2):1-378.

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